TMDL PUBLIC MEETING

FOR THE DEVELOPMENT OF THE

Tidal James River PCB TMDL

February 1, 2011

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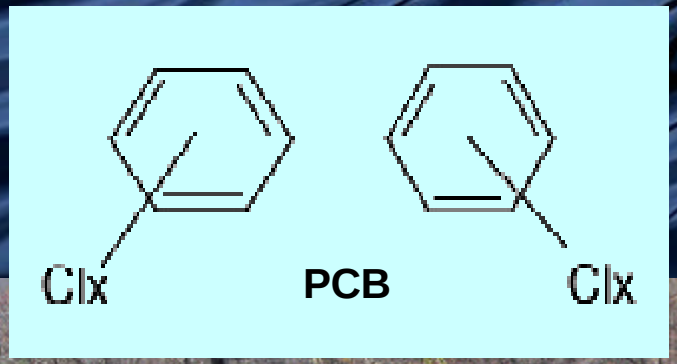
Presentation Topics

- Background
  - Monitoring & assessment
  - PCB Problem
  - What is a TMDL?
- Why do we care about PCBs?
  - Legacy issue??
- Monitoring Results
- TMDL Process



Environmental Monitoring & Assessment

- The Clean Water Act requires the Department of Environmental Quality (DEQ) to:
  - Collect/analyze water and fish samples
  - Assess the samples by comparing to water quality standards (WQS = narrative or numeric)
    - Designated Uses
      - Primary Contact (Swimming)
      - Aquatic Life
      - Fish Consumption
      - Public Water Supply
      - Shellfish consumption

DEQ Fish Tissue Monitoring

- Monitor to assess the "Fishable" Goal of the Clean Water Act
- Target lipophilic or "fat loving" contaminants that accumulate in tissue
  - PCBs, Pesticides, etc.
- Compare to fish trigger values

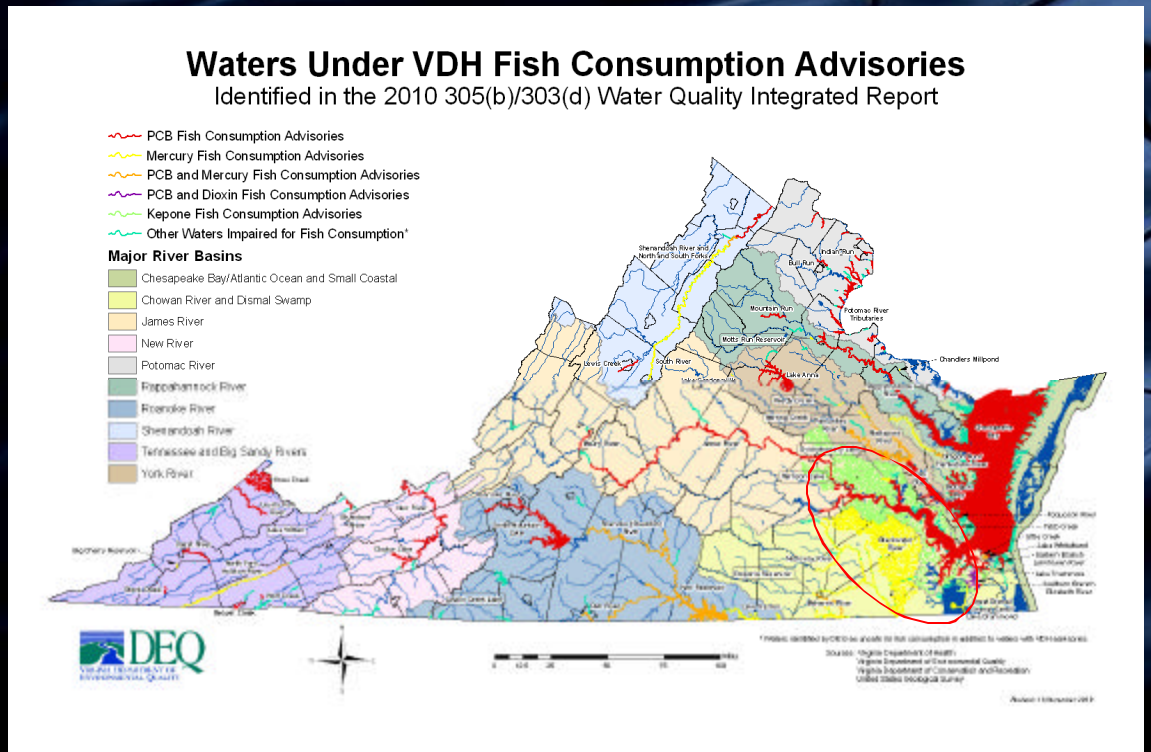
VA Regulatory Criteria

Consumption Advisories Fish Tissue (ppb)	Water Quality Criterion Total PCBs (ppb)
VDH 50	~~0.0017 (old)~~
DEQ (screening) 20	0.00064 (new)

Criterion represents target concentration in the water column that minimizes the bioaccumulation of tPCBs in fish to protect human consumption

Environmental Assessment

- Problem waters are identified in the 305(b)/303(d) Integrated Report (2 year cycle)
  - "Impaired waters" = exceed trigger values
- TMDL required for impaired waters (State & Federal Law)



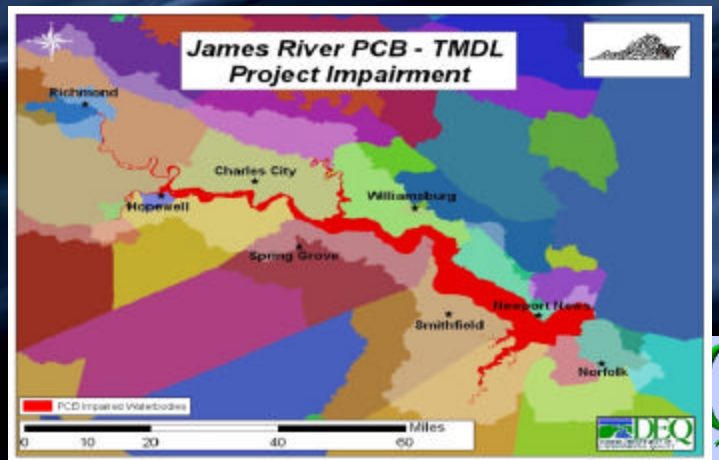
DEQ

Tidal James River Fish Consumption Advisory (VDH) for PCBs

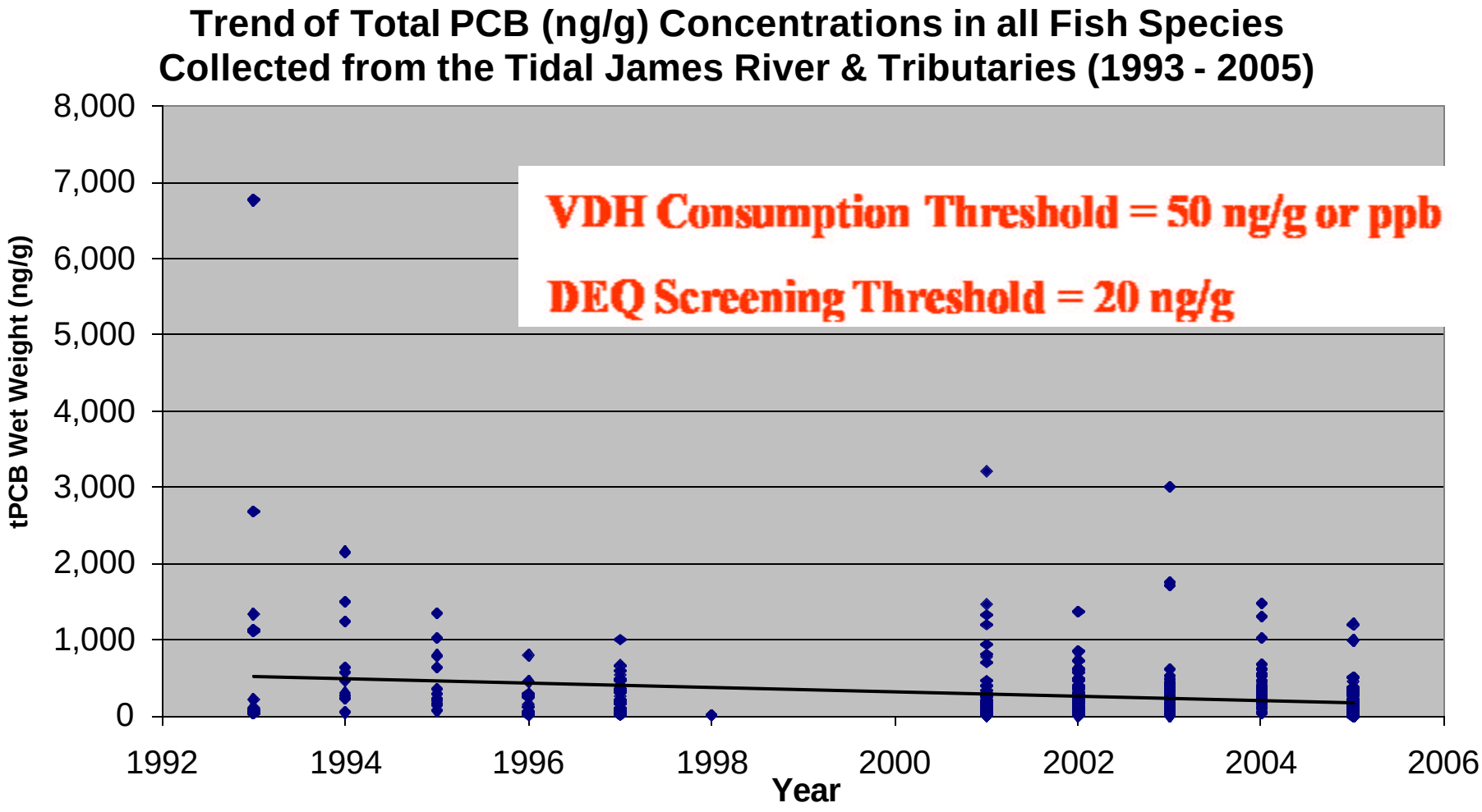
I-95 bridge in Richmond downstream to Hampton Roads Bridge Tunnel

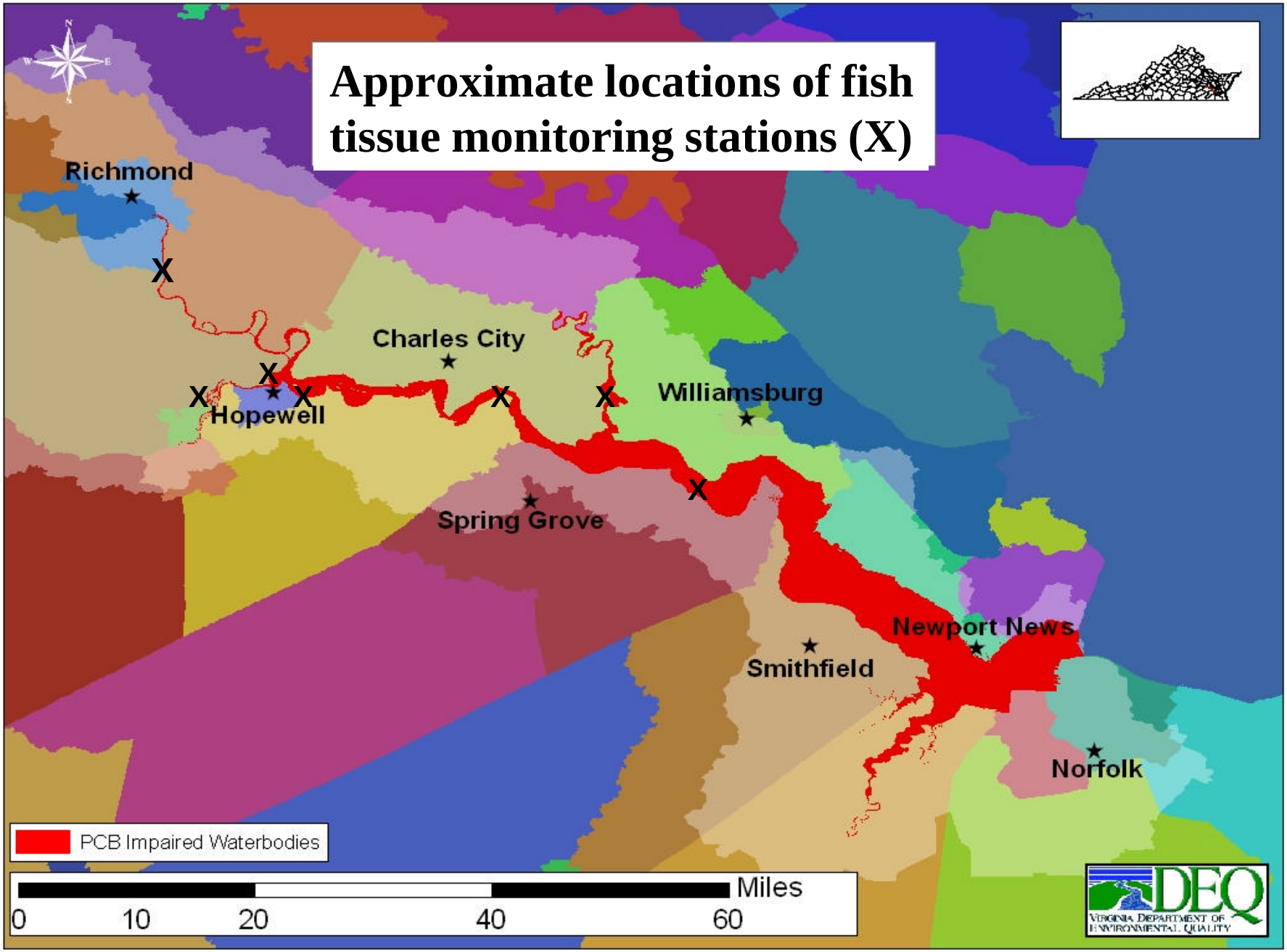
Includes Appomattox R., Bailey Crk, Poythress Run, Bailey Bay, Chickahominy R. (to Walkers Dam)

Fish Species	Advisory
Gizzard Shad, Carp, Blue Catfish & Flathead Catfish ≥ 32 inches	Do Not Eat
Blue Catfish & Flathead Catfish < 32 inches, Channel Catfish, White Catfish, Largemouth Bass, Bluegill Sunfish, American Eel, Quilback Carpsucker, Smallmouth Bass, Creek Chub, Yellow Bullhead Catfish, White Perch, Striped Bass, Hickory Shad	No more than two meals/month

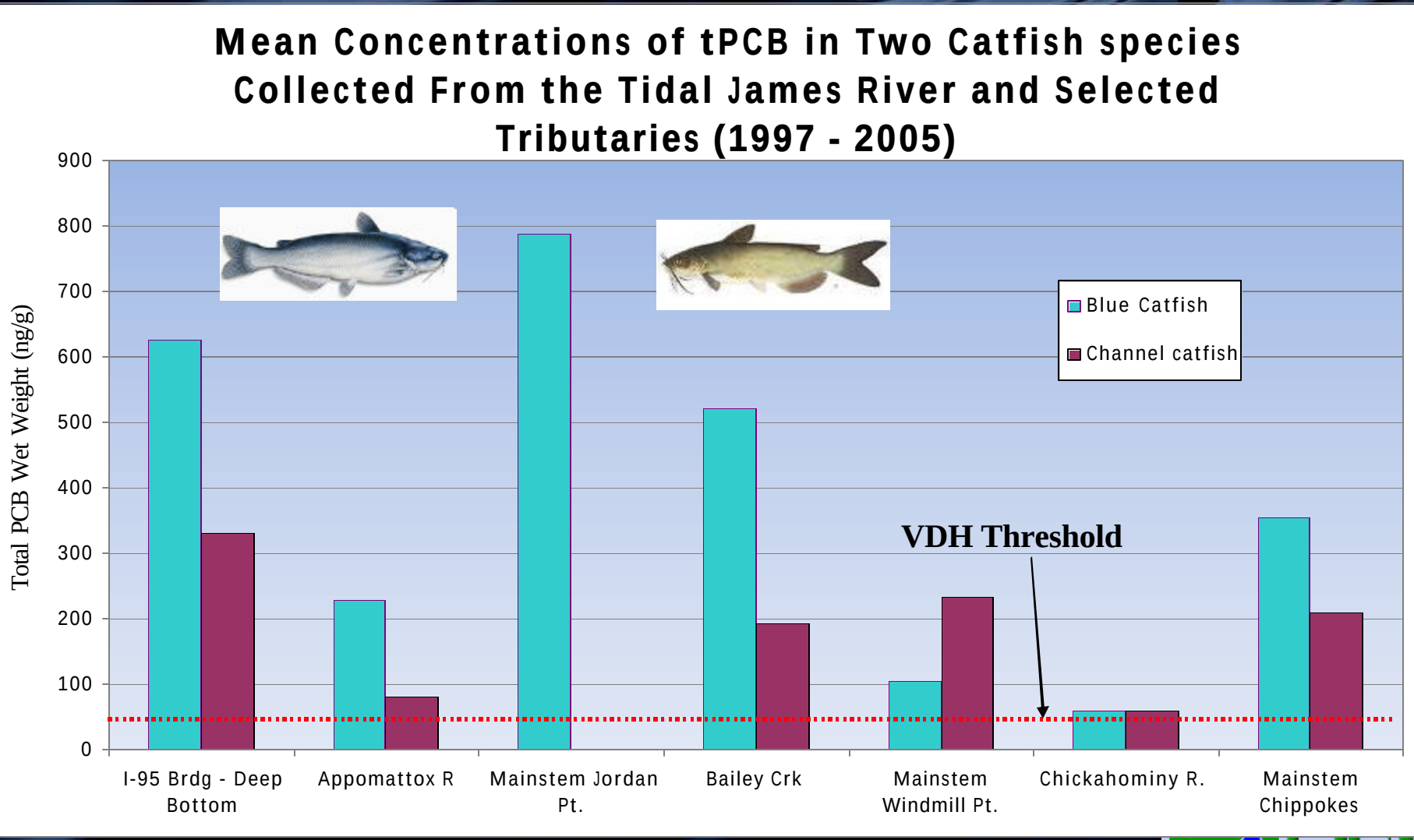


Fish Tissue Results



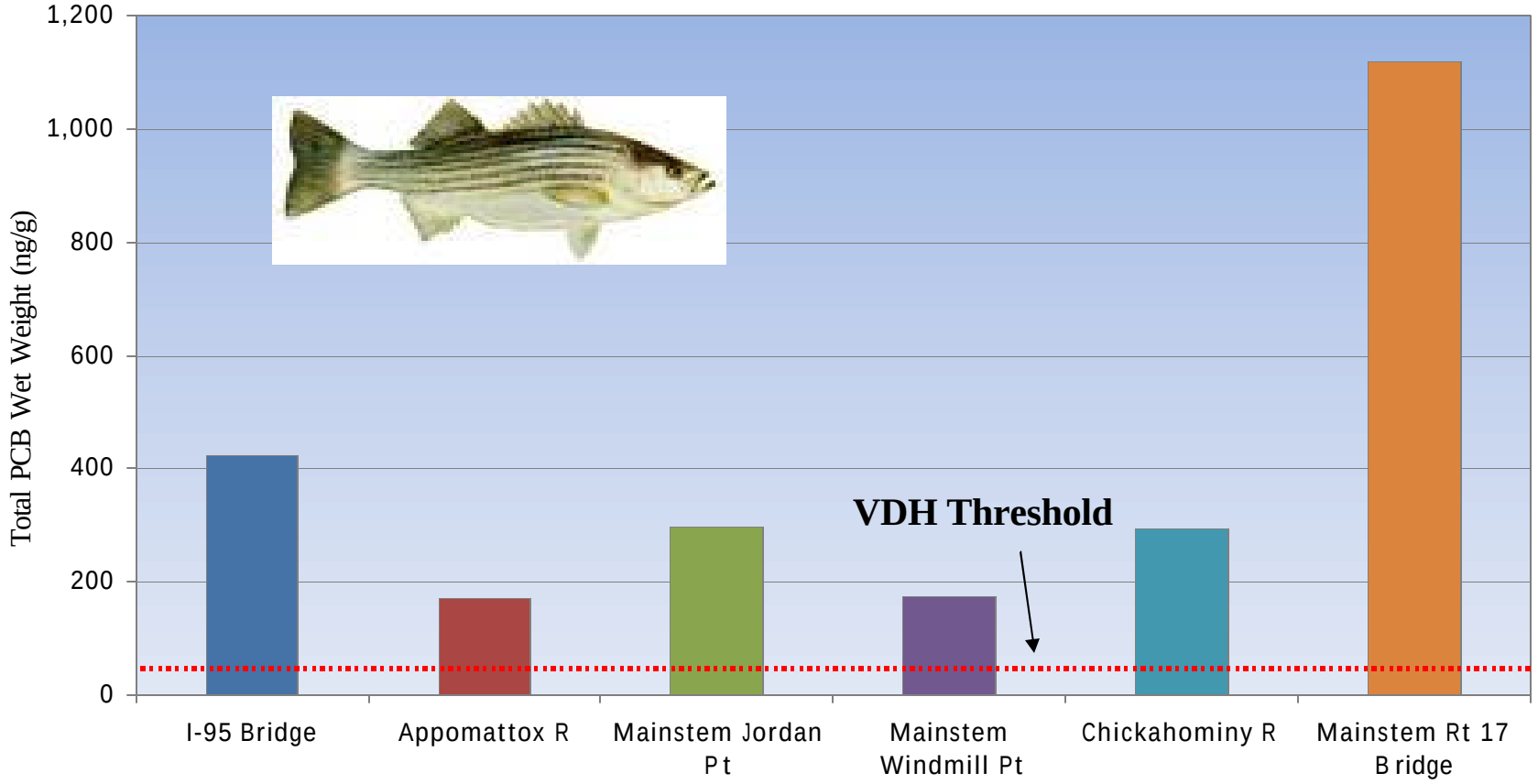

Approximate locations of fish tissue monitoring stations (X)
Richmond
Charles City
Hopewell
Williamsburg
Spring Grove
Newport News
Smithfield
Norfolk
PCB Impaired Waterbodies
Miles
0
10
20
40
60
DEQ
Virginia Department of Environmental Quality

Fish Tissue Results

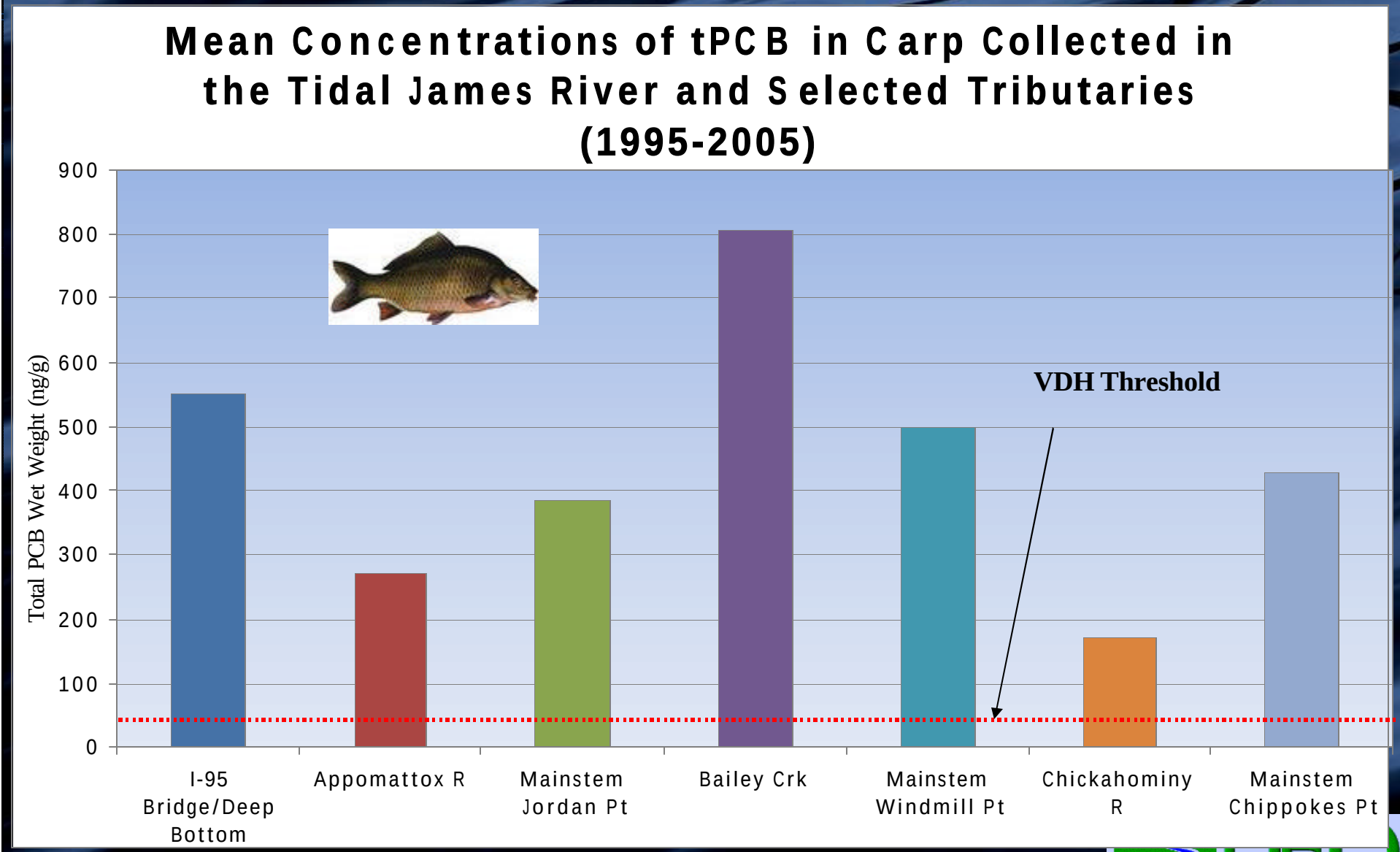


Fish Tissue Results

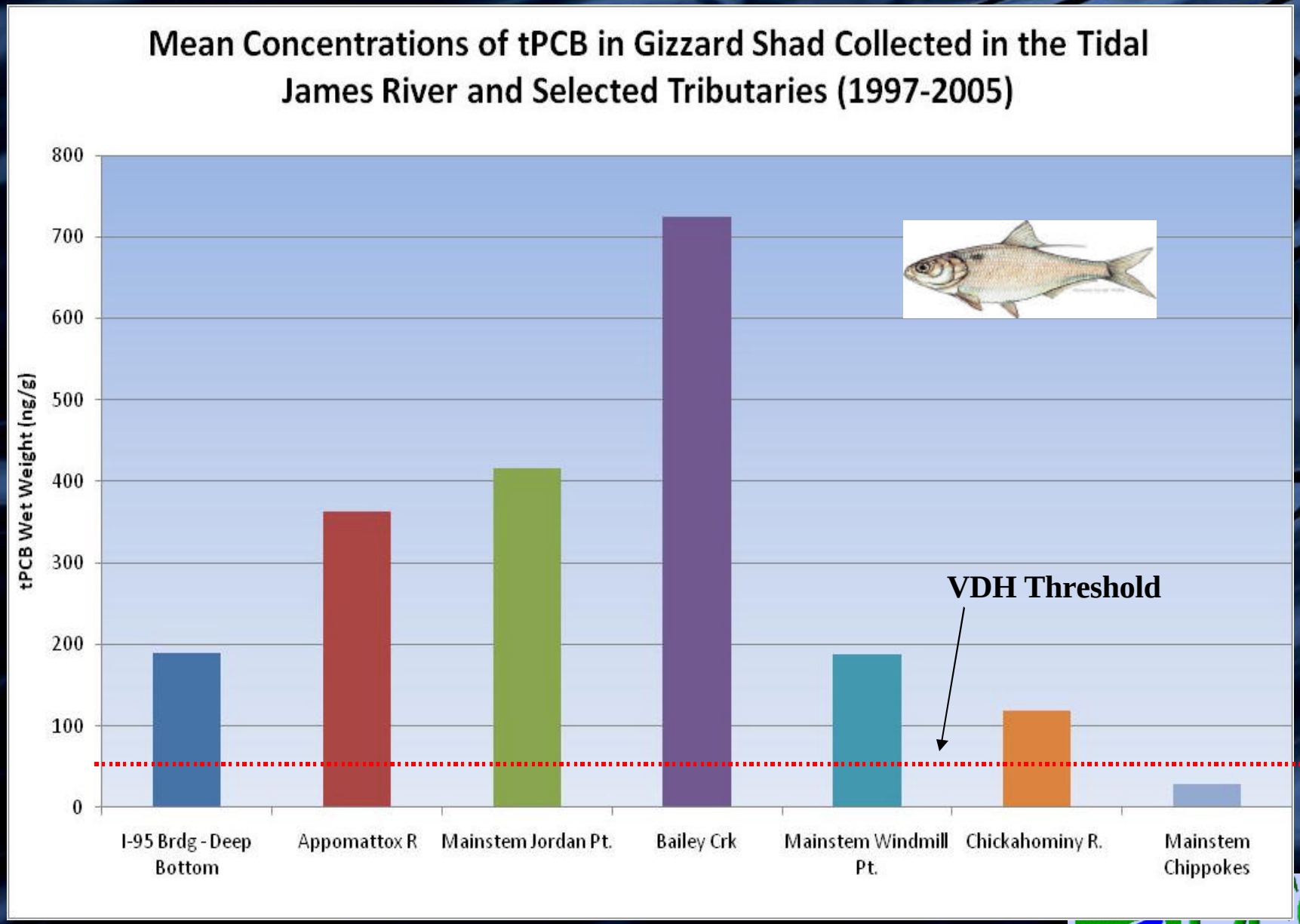
Mean Concentrations of tPCB in Striped Bass Collected From the Tidal James River and Selected Tributaries (1993 - 2005)



Fish Tissue Results



Fish Tissue Results



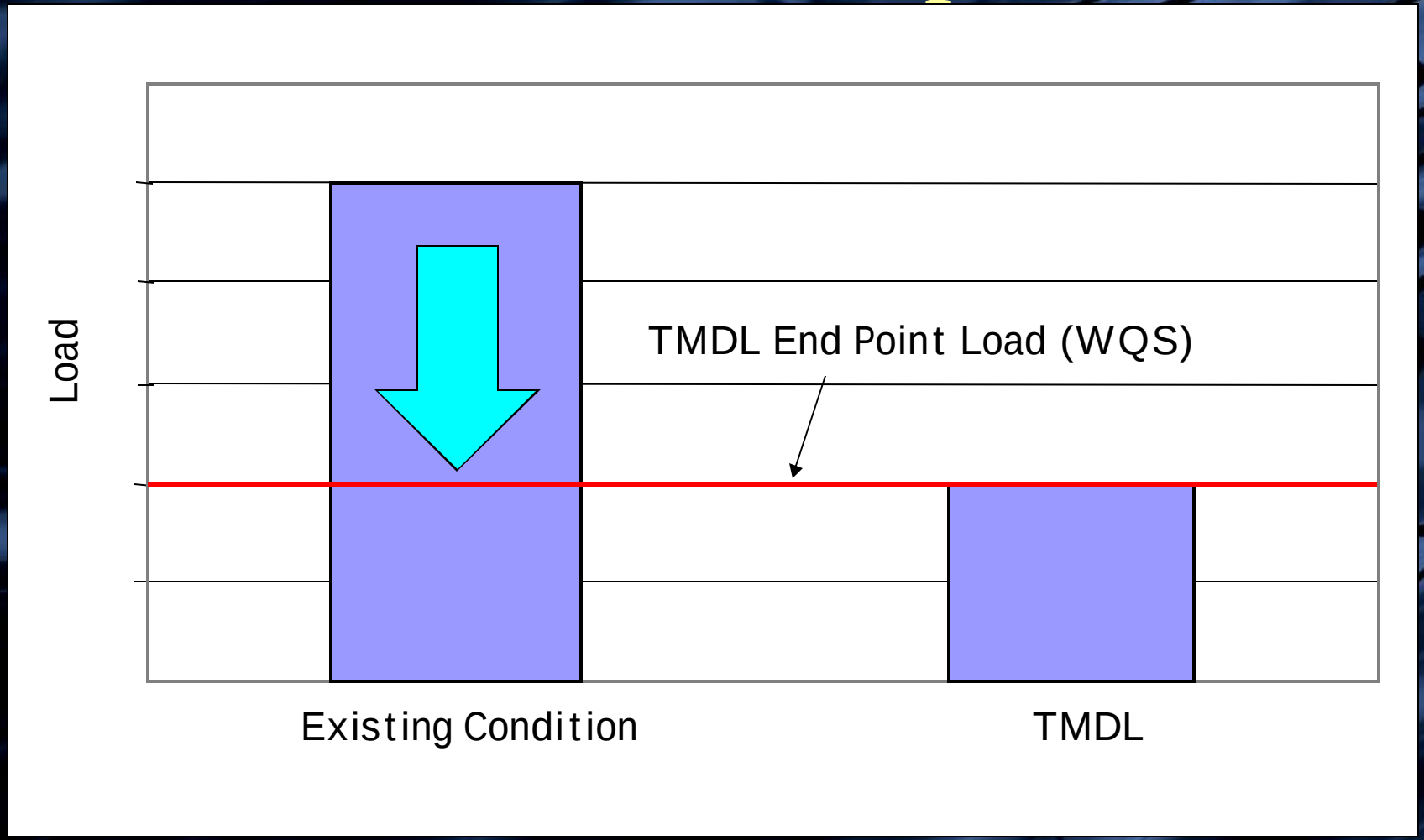
Questions So Far?

What is a TMDL or Total Maximum Daily Load?

TMDL = maximum amount of a pollutant that can exist in a waterbody without violating water quality standards (WQS)

Goal = restore impaired waters

TMDL Example



Reducing existing pollutant load to the TMDL end point load is expected to restore water quality

Why are TMDL Studies Necessary?

- Federal & State Laws
  - 1972 Clean Water Act (section 303d)
  - 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA)
  - 1999 Consent Decree (American Canoeist Association Lawsuit)
- Developed for waterways where WQC not met for applicable designated use
  - Designated Uses
    - Primary Contact (Swimming), Aquatic Life, Fish Consumption, Public Water Supply, Shellfish consumption

How Does a TMDL Restore Impaired Waters?

- TMDL process includes a special study that:
  - Identifies pollutant sources (non-point and point sources)
  - Determines pollution contributed by source
  - Estimates pollution reductions necessary to attain WQS

WLA + LA + MOS = TMDL

WLA = waste load allocation (point sources)

LA = load allocation (non-point sources)

MOS = margin of safety (usually implicit)

TMDL = total maximum daily load

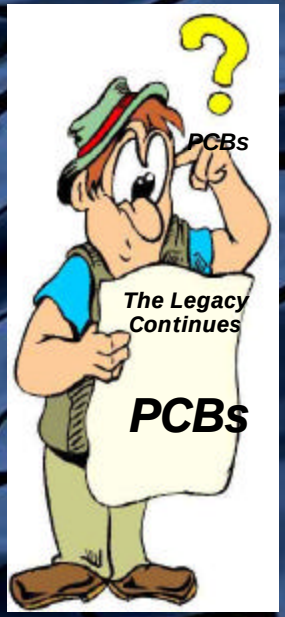
What are the Steps in the TMDL Process?

I. TMDL Study
   I. Public notice and comment period of study initiation
   II. Additional monitoring, source evaluation and watershed modeling
   III. Public notice for Draft TMDL
   IV. Public meeting and comment period
   V. Final draft approved by EPA and SWCB

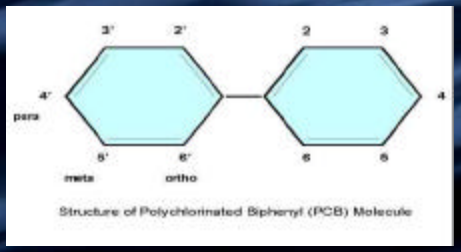
II. Implementation thru Adaptive Management with Appropriate Corrective Actions Prescribed by Final TMDL

Questions about the TMDL Process?

What are PCBs and why do we care about them?



- Biphenyl molecule (1-10 chlorine atoms)



- 209 distinct PCB Compounds
- Regulated by VADEQ as Total PCB (tPCB) = 209 Compounds Summed
- Referred to as PCB Aroclors (Monsanto tradename) = mixture of PCB compounds

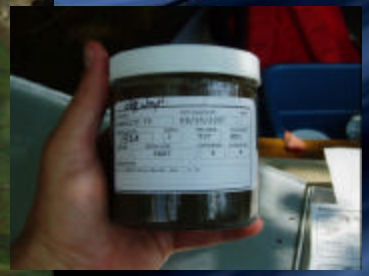
PCB 101

- Estimated that > 1.5 Billion lbs. manufactured in the U.S. until 1977 - "Legacy Contaminant"
- Very stable and heat resistant
  - Persistent in environment
- Common uses:
  - Transformers, capacitors, hydraulic fluids, circuit breakers, PVC Products, carbonless copy paper, caulking material, paints, etc.

DEQ

PCBs - A Legacy Pollutant?

- Banned in late 70's
- Accumulate and persist in river sediments from historic releases
  - "Hot Spots"
- Traditionally not detected under VPDES (permitting) Program



PCBs – Current Releases(?)

- PCBs used many years after banned
- Contaminated sites with active transport (non-point - e.g., CERCLA, RCRA, VRP, unknown)
- Point Sources
- Dielectric oils considered non PCB < 50 ppm
  - Fish advisories at 0.05 ppm
- Inadvertent production
  - Carbon + heat + chlorine
  - Up to 50 ppm allowed (TSCA)
- Atmosphere

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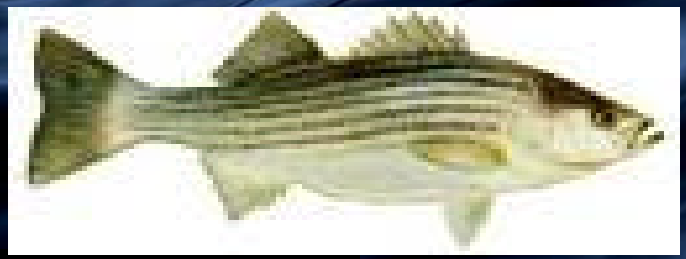
How Are Fish Exposed To PCBs?

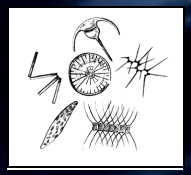
- Intake through gills from water column
  - Basis of existing WQC (1980 EPA guidelines)
- Ingestion of contaminated sediment
  - Indirect uptake from foraging

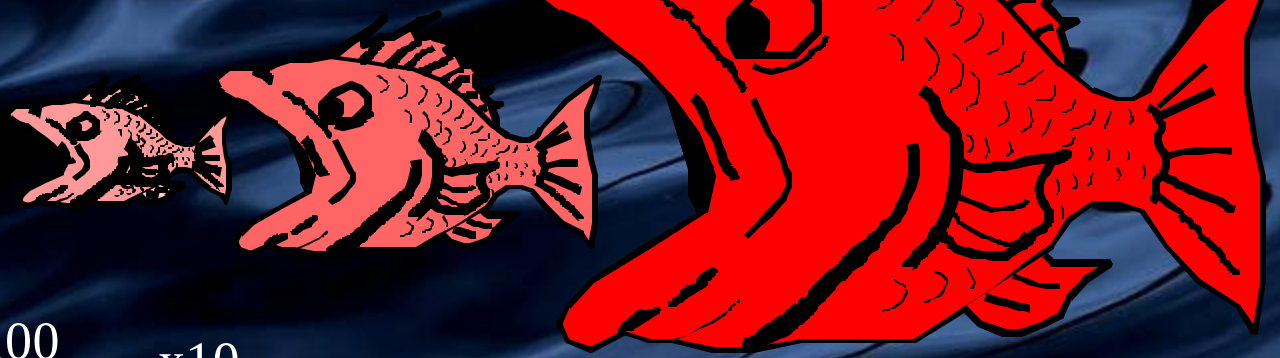
- Exposure through skin from contaminated sediment (e.g. catfish)
- Ingestion of prey
  - Biomagnification



Biomagnification

PCBs
H_2O





x1000 x100 x10 x2

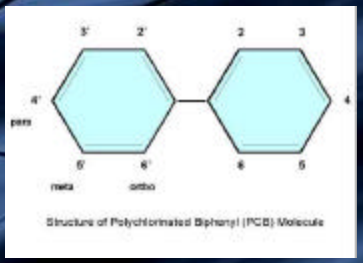
Concentration (parts per trillion)

0.001 1 1,000 10,000 20,000

Why are PCBs an Issue?

- Bioaccumulates at low conc. (lipids)
- Suspected carcinogen
- Other toxicological effects (humans)
  - Immunotoxicity, reproduction and developmental, hepatotoxicity (liver), neurotoxicity, and chloracne
- Major Sources of Exposure (humans)
  - Consumption of contaminated fish
  - Inhalation (dust from contaminated sites)

WQC = 0.00064 ug/L



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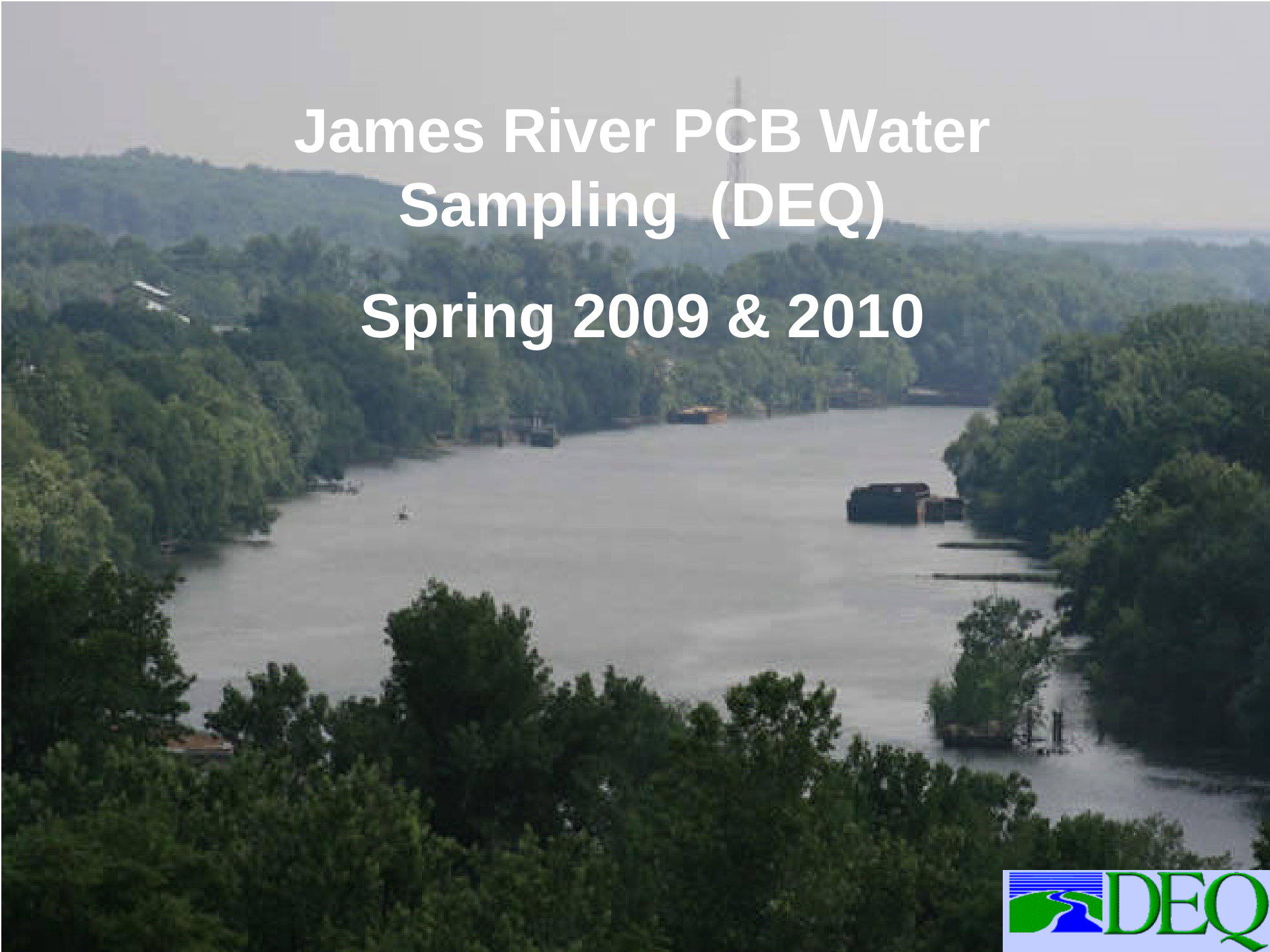
Questions about PCBs?

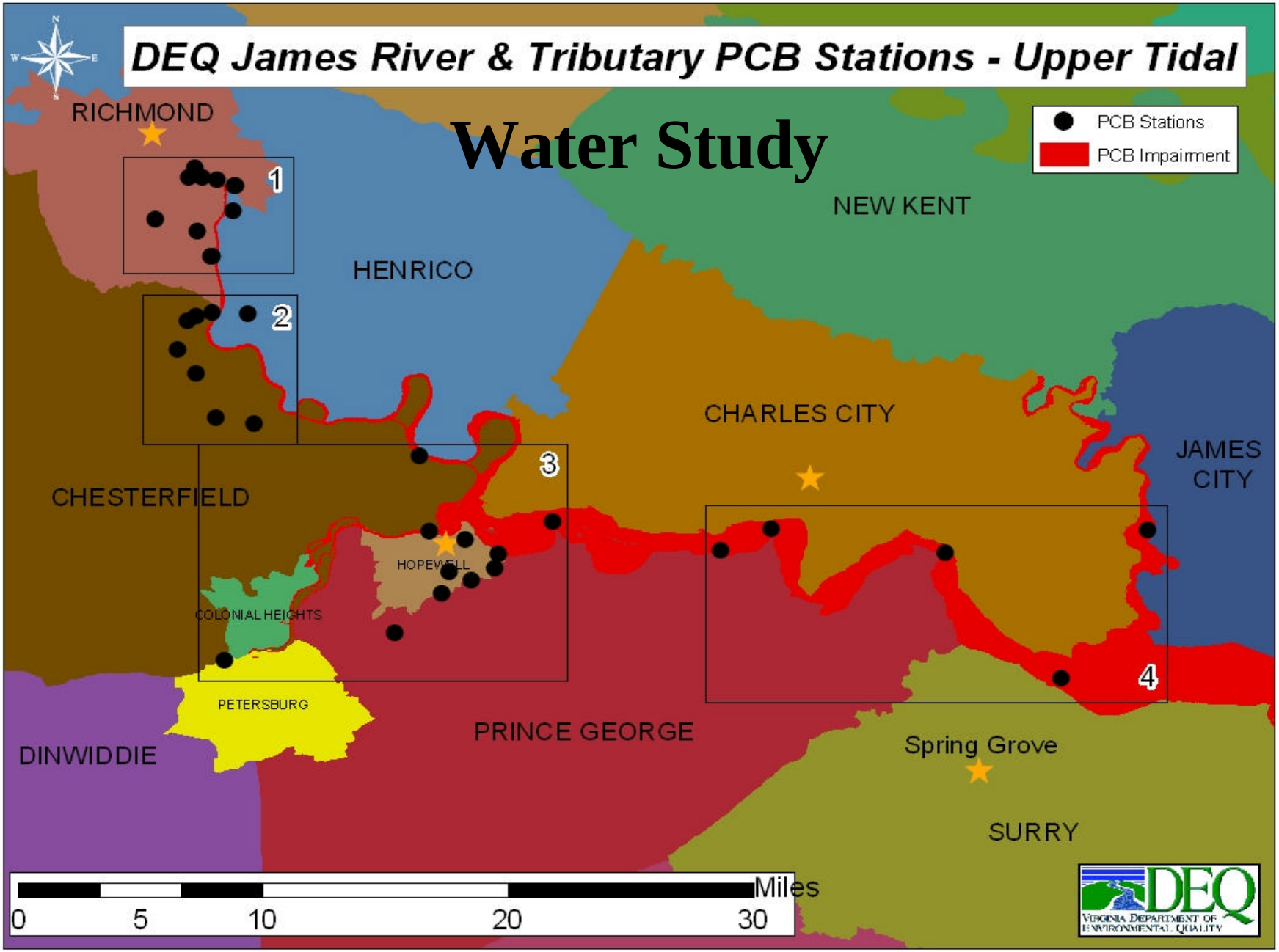


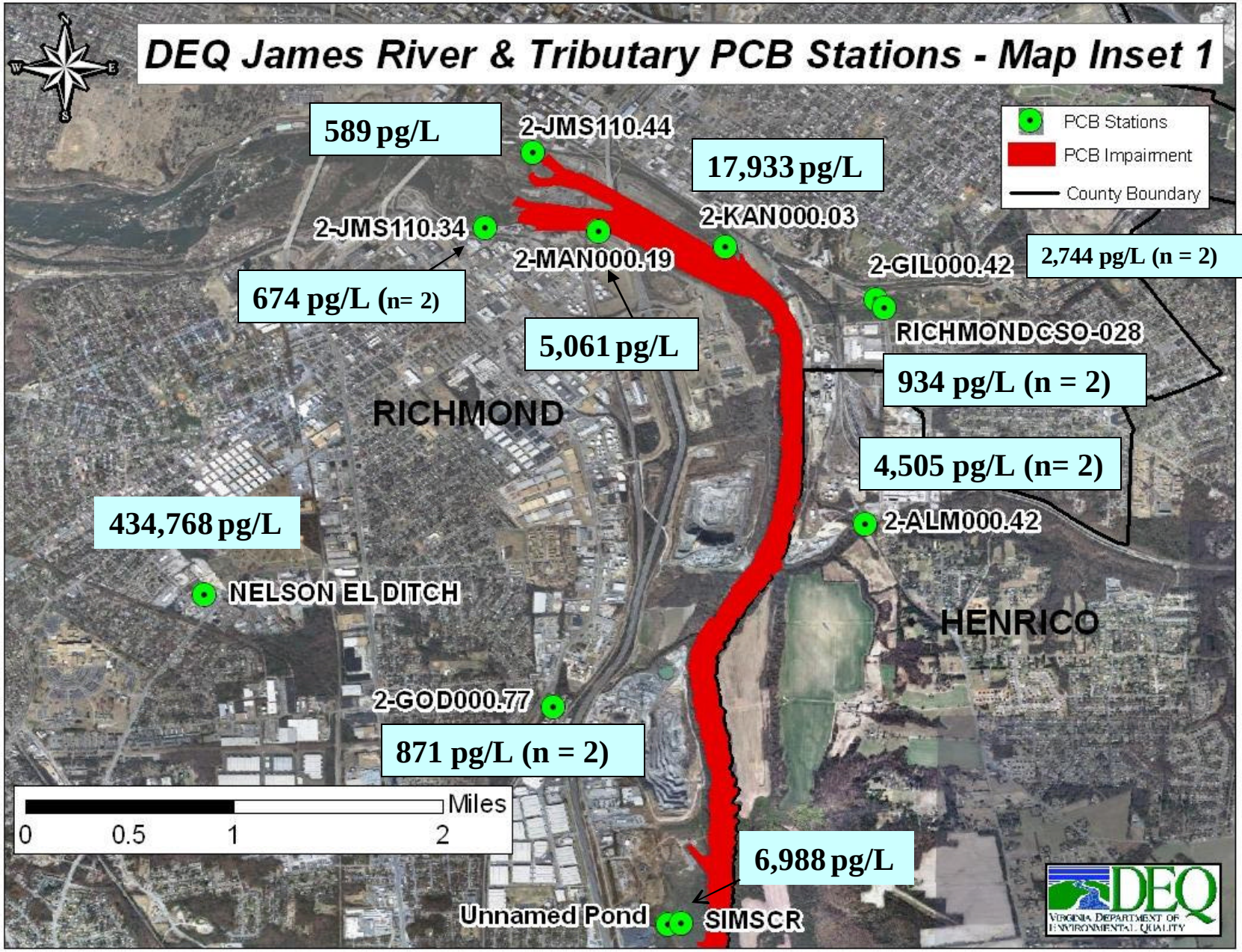
James River PCB Water Sampling (DEQ)

Spring 2009 & 2010

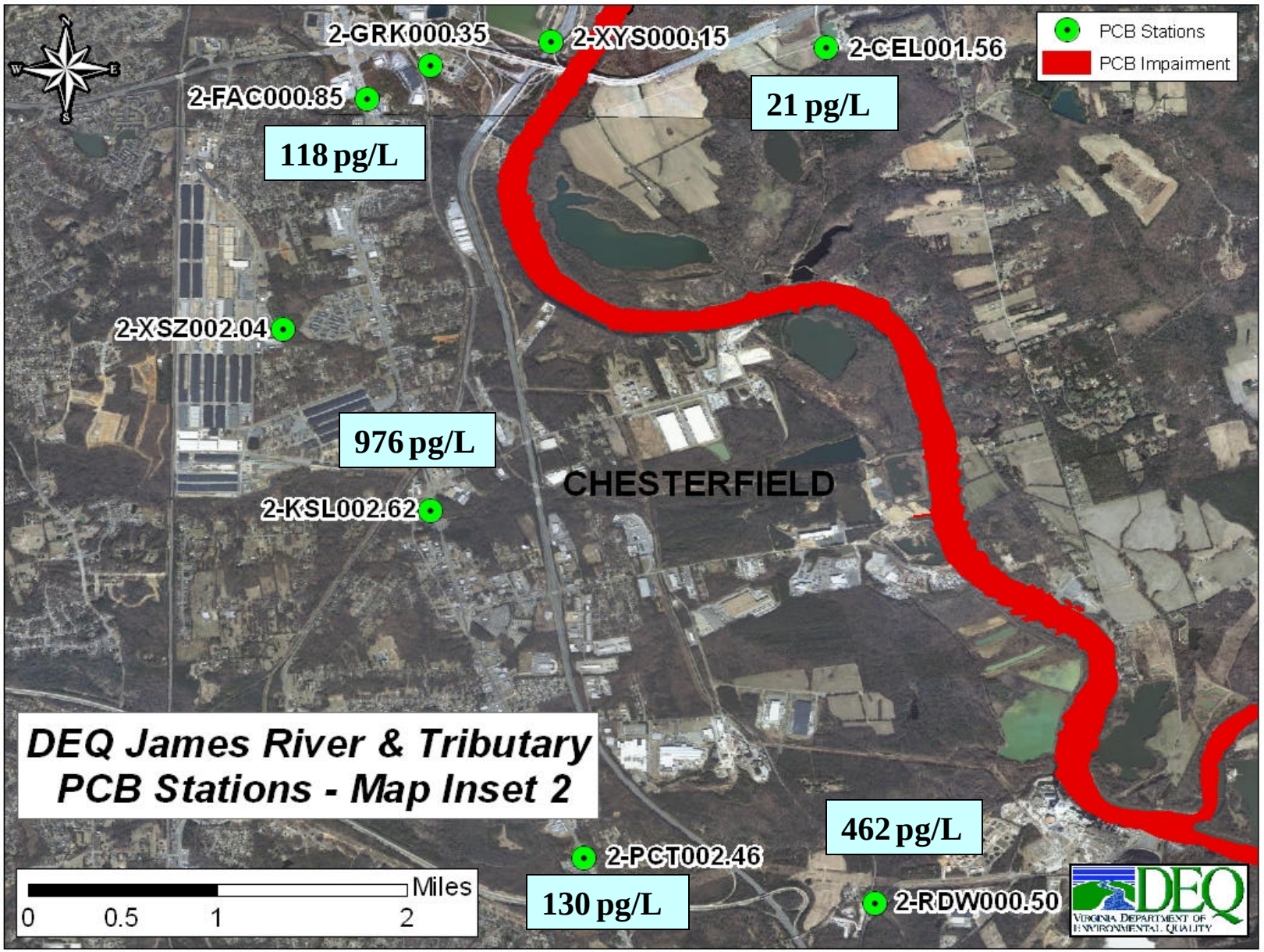
PCB Water Study

- Water samples collected April – May 2009 and at selected stations in April 2010
- Targeted wet and dry weather
- Used EPA Method 1668 for analysis
  - Low level detection method

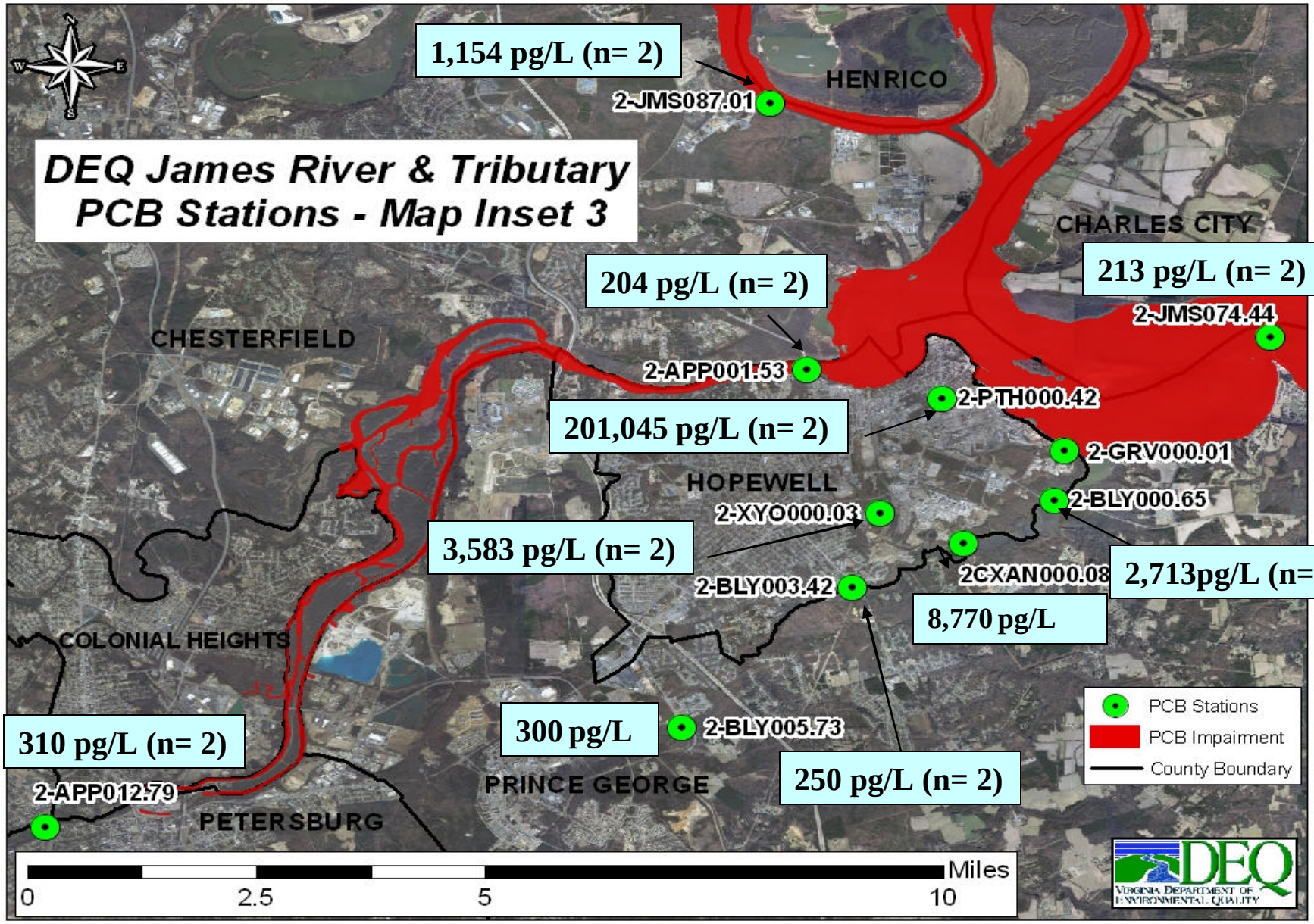

DEQ James River & Tributary PCB Stations - Upper Tidal
Water Study
PCB Stations
PCB Impairment
RICHMOND
HENRICO
NEW KENT
CHARLES CITY
JAMES CITY
CHESTERFIELD
HOPEWELL
COLONIAL HEIGHTS
PETERSBURG
PRINCE GEORGE
DINWIDDIE
Spring Grove
SURRY
1
2
3
4
Miles
0
5
10
20
30
DEQ
Virginia Department of Environmental Quality


DEQ James River & Tributary PCB Stations - Map Inset 1
589 pg/L
2-JMS110.44
17,933 pg/L
2-KAN000.03
2-JMS110.34
2-MAN000.19
2-GIL000.42
2,744 pg/L (n = 2)
674 pg/L (n= 2)
5,061 pg/L
RICHMONDCSO-028
934 pg/L (n = 2)
RICHMOND
4,505 pg/L (n= 2)
434,768 pg/L
2-ALM000.42
NELSON EL DITCH
HENRICO
2-GOD000.77
871 pg/L (n = 2)
Miles
0
0.5
1
2
6,988 pg/L
Unnamed Pond
SIMSCR
PCB Stations
PCB Impairment
County Boundary
DEQ
Virginia Department of Environmental Quality

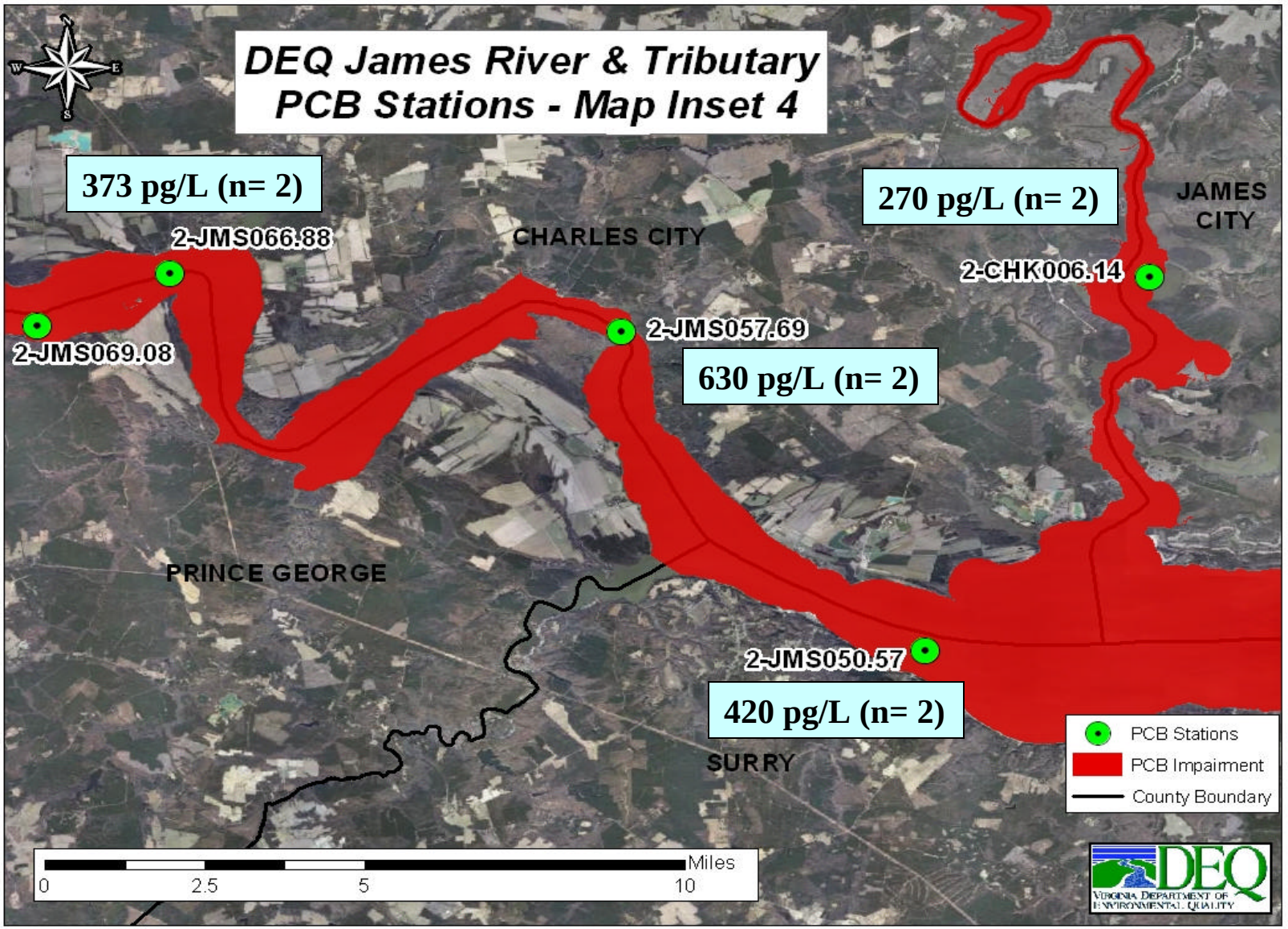
WQC = 640 pg/l


PCB Stations
PCB Impairment
2-GRK000.35
2-XYS000.15
2-CEL001.56
21 pg/L
2-FAC000.85
118 pg/L
2-XSZ002.04
976 pg/L
CHESTERFIELD
2-KSL002.62
DEQ James River & Tributary
PCB Stations - Map Inset 2
462 pg/L
2-PCT002.46
130 pg/L
2-RDW000.50
Miles
0
0.5
1
2
DEQ
Virginia Department of Environmental Quality

WQC = 640 pg/l


DEQ James River & Tributary
PCB Stations - Map Inset 3
1,154 pg/L (n= 2)
2-JMS087.01
HENRICO
CHARLES CITY
213 pg/L (n= 2)
2-JMS074.44
204 pg/L (n= 2)
CHESTERFIELD
2-APP001.53
2-PTH000.42
201,045 pg/L (n= 2)
2-GRV000.01
HOPEWELL
2-BLY000.65
2-XYO000.03
3,583 pg/L (n= 2)
2CXAN000.08
2,713pg/L (n= 2)
2-BLY003.42
8,770 pg/L
COLONIAL HEIGHTS
310 pg/L (n= 2)
300 pg/L
2-BLY005.73
PRINCE GEORGE
250 pg/L (n= 2)
2-APP012.79
PETERSBURG
PCB Stations
PCB Impairment
County Boundary
Miles
0
2.5
5
10
DEQ
Virginia Department of Environmental Quality

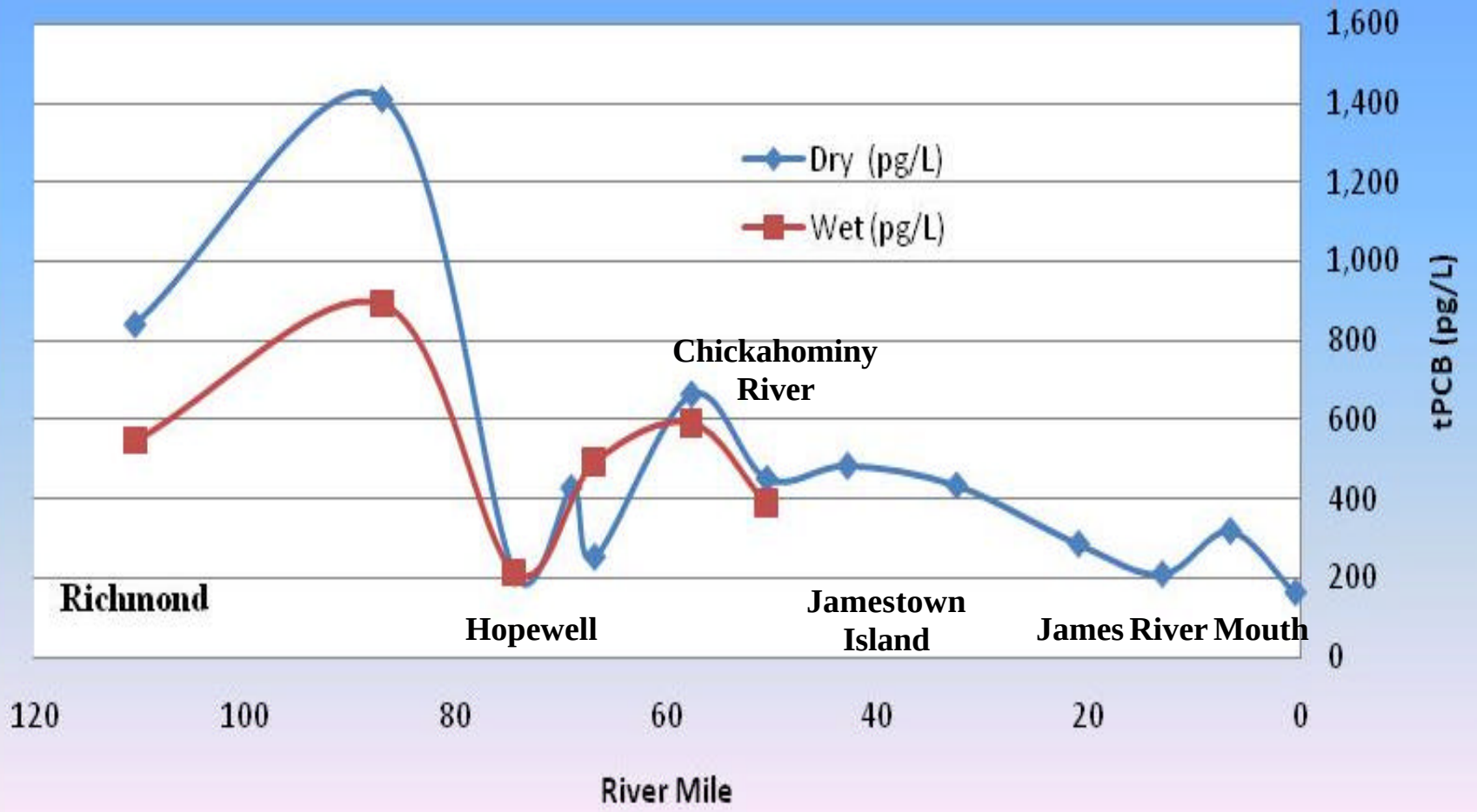
WQC = 640 pg/l

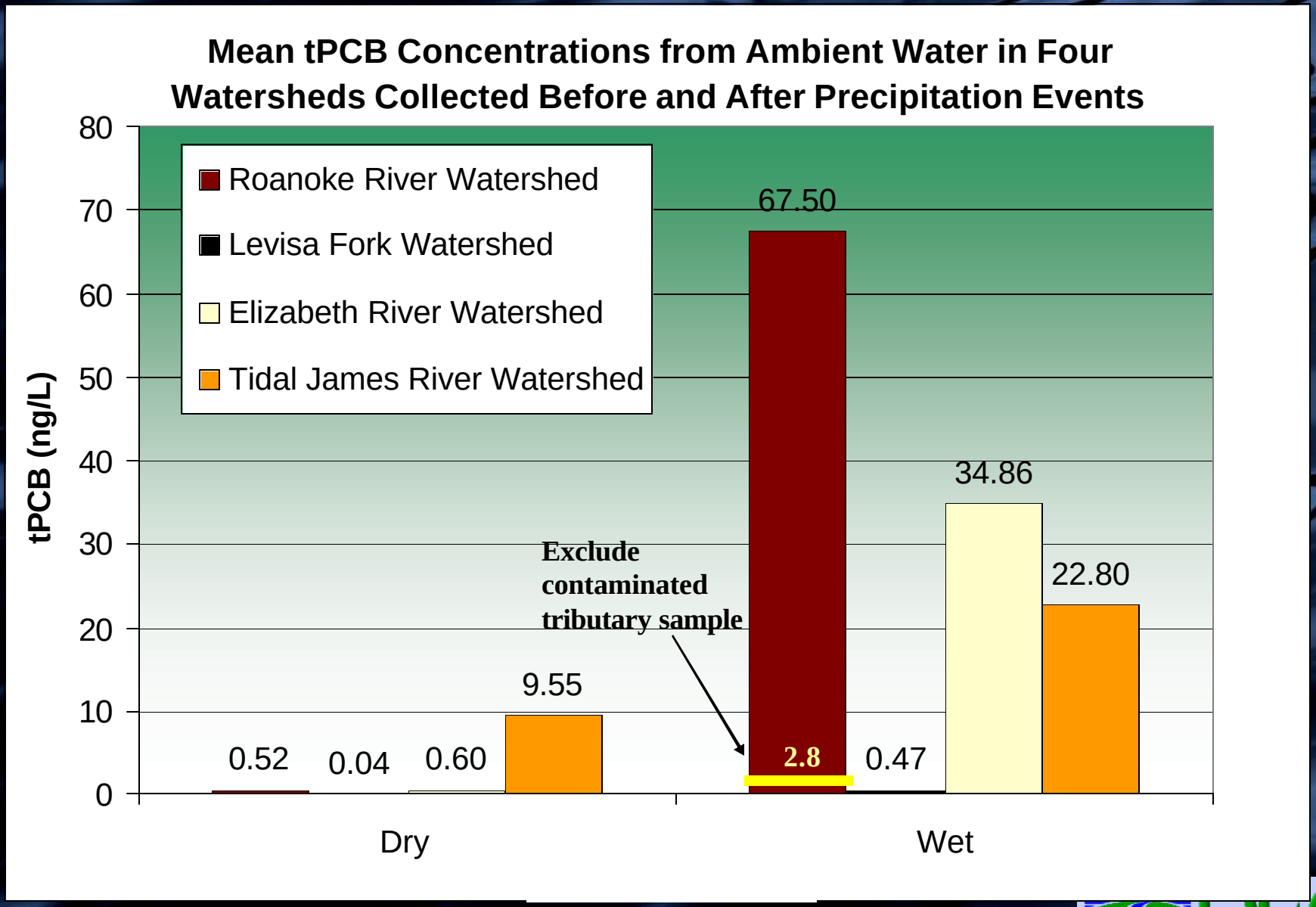


WQC = 640 pg/l

DEQ

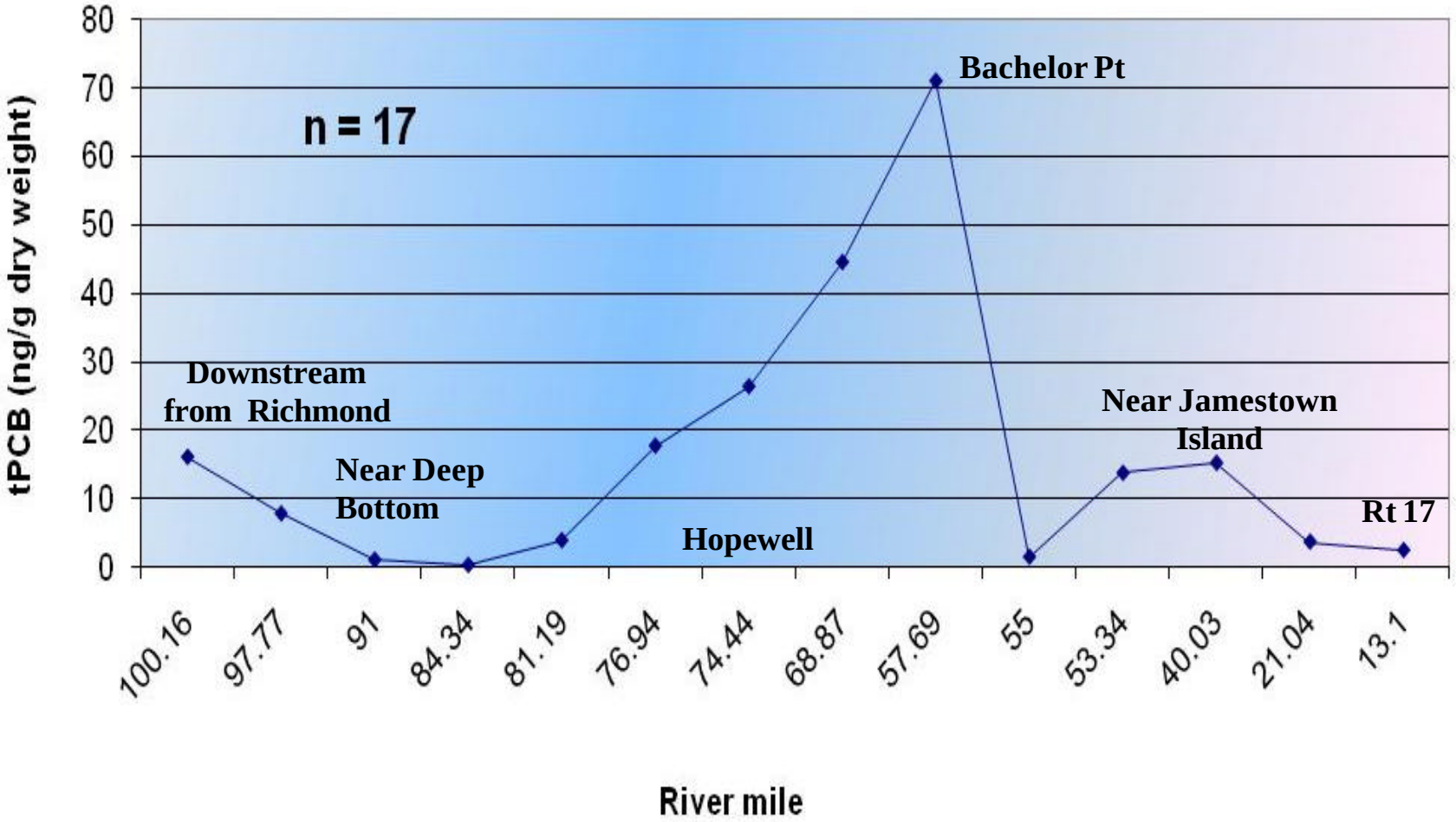
tPCB Concentrations in Ambient River Water Collected from the Tidal James River Mainstem




Mean tPCB Concentrations from Ambient Water in Four Watersheds Collected Before and After Precipitation Events
tPCB (ng/L)
80
70
60
50
40
30
20
10
0
Roanoke River Watershed
Levisa Fork Watershed
Elizabeth River Watershed
Tidal James River Watershed
0.52
0.04
0.60
9.55
2.8
67.50
0.47
34.86
22.80
Exclude contaminated tributary sample
Dry
Wet

Concentrations of tPCBs in Sediments Collected in the Mainstem James River

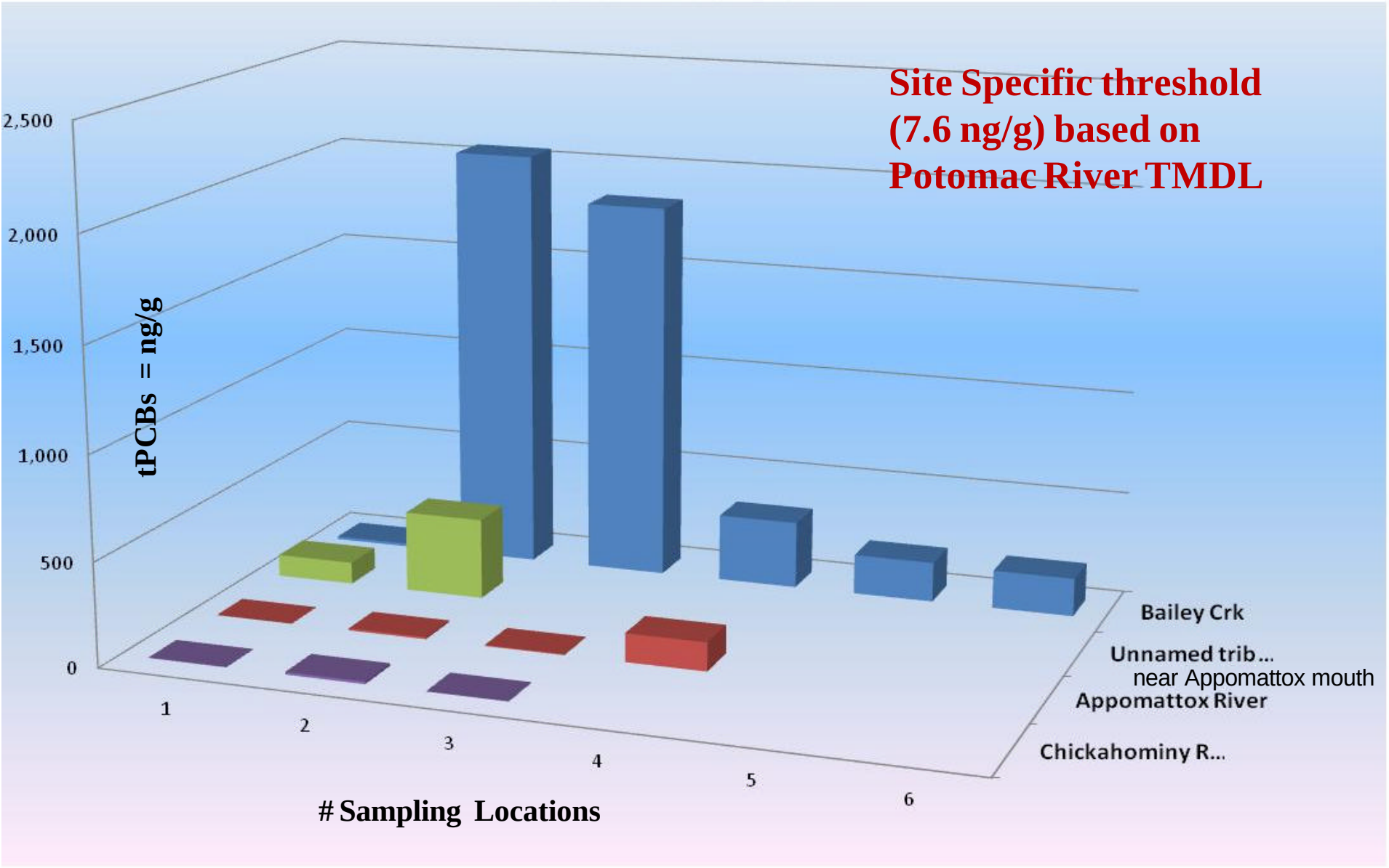
(Sampling Yrs '95, '96, '97, '01, '04, '05)



Eg. - sediment threshold to protect fish = 7.6 ng/g (Potomac R. PCB TMDL)

Mean tPCB Concentrations in Sediments Collected from Tributaries to the James River

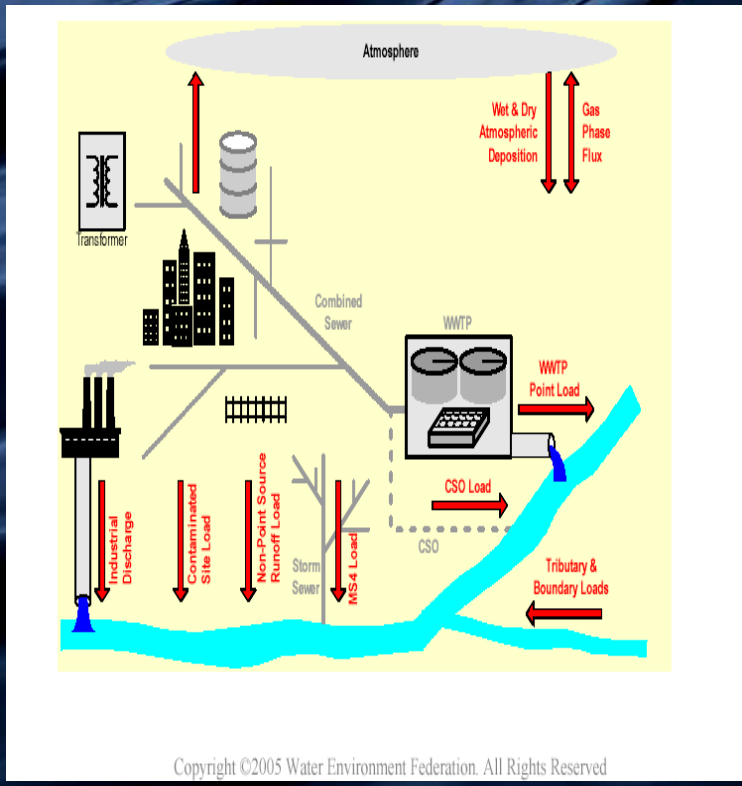
Samples Collected '96 -'05



Questions PCB Monitoring?

TMDL Source Assessment - Load Categories-

- Point Sources
  - WWTPs, Industry, Industrial SW, CSOs
  - MS4
- Non-point Sources
  - Non-Regulated Stormwater (Direct Drainage)
  - Contaminated Sites
  - Atmospheric Deposition
  - River Sediment



Point Sources

- DEQ requested voluntary monitoring of point source outfalls
  - Informational meetings held:
    - Upper Tidal James- September 2009
    - Middle & Lower Tidal James – October 2010
    - Elizabeth River – November 2009
  - PCB Data requested by Sept. – Oct. 2011
  - Facilities selected in accordance with DEQ's PCB Guidance Document

    See: http://www.deq.virginia.gov/tmdl/pcb.html

Components of TMDL Study

Fish Consumption Advisory

Identify Problem

On-going

Source Assessment
- Identify sources
- Estimate source loading

Method 1668
Low Level PCB Analysis

Link Sources to Targets
- Assess linkages
- Estimate total loading capacity

TMDL Allocations
- Divide loads among sources (WLA and LA)

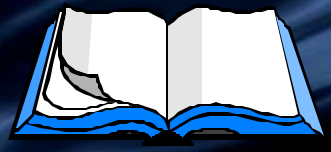
WLA + LA + MOS = TMDL

Tidal James River PCB TMDL

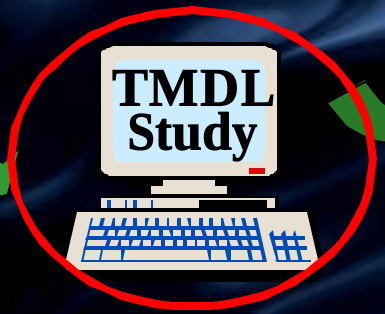
In Summary…

Total Maximum Daily Load

Implementation



We Are Here



- Identifies permit controls, best management practices, or remediation options needed to make necessary pollutant reductions

Implementation

- Calculates amounts from each source
- Tracks pollutants in the system
- Sets maximum pollutant load
- Estimates necessary pollutant reductions

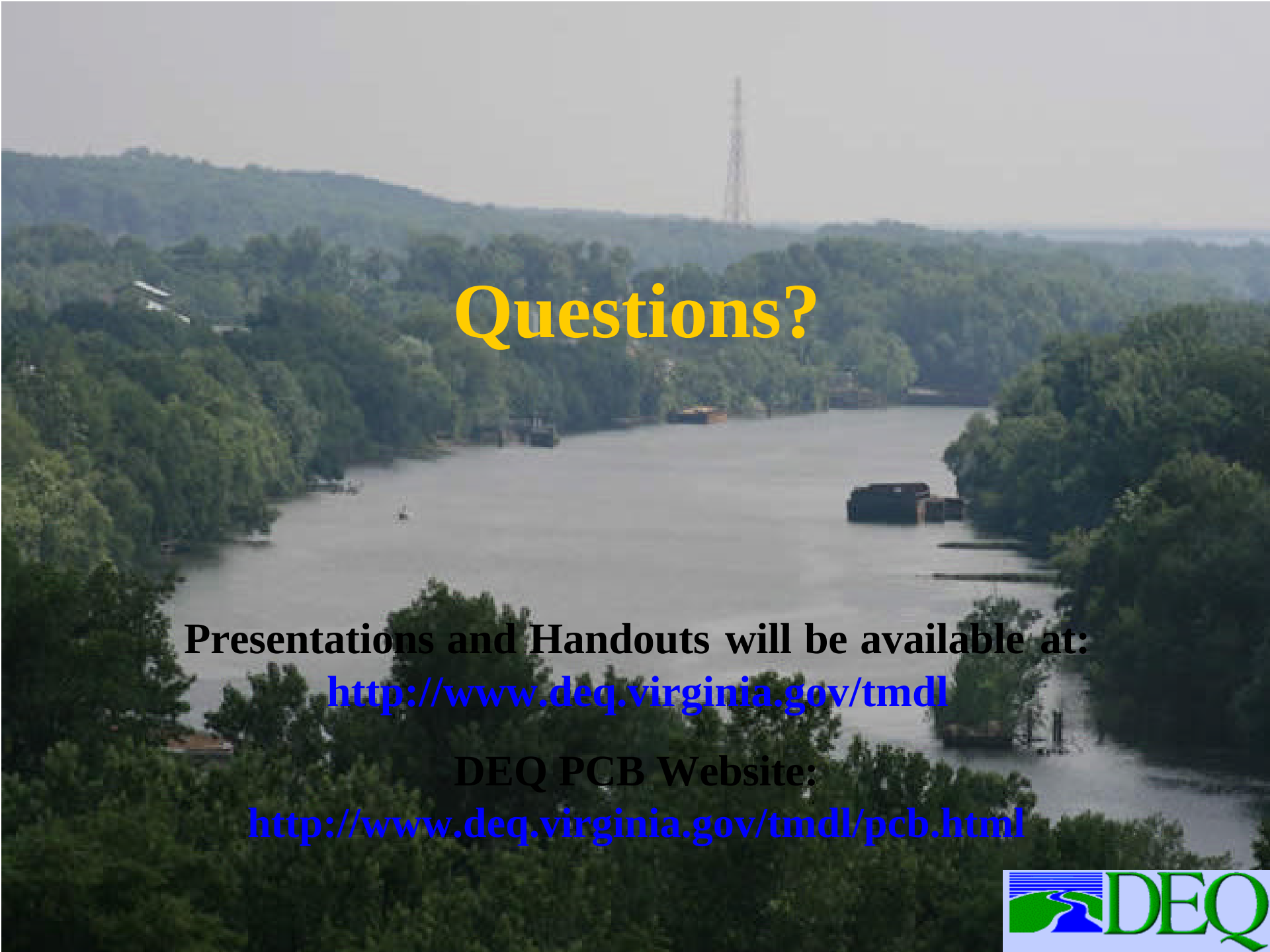
Clean

Water quality standards met

Water quality standards not met

The Process

DEQ



Questions?

Presentations and Handouts will be available at:
http://www.deq.virginia.gov/tmdl

DEQ PCB Website:
http://www.deq.virginia.gov/tmdl/pcb.html

Public Comment Period
February 2 thru March 4, 2011

Please Submit Comments To:

Margaret Smigo
4949-A Cox Rd
Glen Allen, VA 23060

or

Margaret.Smigo@deq.virginia.gov

Extra Slides

Station ID	Station Description	Date	Sample Type	Total PCBs (pg/L)
James River Mainstem				
2-JMS110.34	South Channel last riffle above Mayos Bridge (Fall line)	4/15/2009	Dry	843
		5/7/2009	Wet	505
2-JMS110.44	North Channel (Fall line)	5/7/2009	Wet	589
2-JMS087.01	James River at Buoy 137	5/19/2009	Dry	1,413
		4/16/2009	Wet	894
2-JMS074.44	James R. at Rt 156, Benjamin Harrison Bridge	5/19/2009	Dry	212
		4/16/2009	Wet	214
2-JMS069.08	James River opposite Herring Creek, Buoy 91	4/28/2010	Dry	429
2-JMS066.88	James R. at powerline at Windmill Pt., Buoy 86	5/19/2009	Dry	254
		4/21/2009	Wet	492
2-JMS057.69	James River at Bachelor Pt, Buoy 74A	4/28/2010	Dry	666
		10/4/2010	Wet	593
2-JMS050.57	James River opposite Dancing Pt, Buoy 66	8/3/2010	Dry	452
		5/19/2010	Wet	388
Appomattox River				
2-APP012.79	Appomattox R. at Rt. 36, Petersburg	5/20/2009	Dry	398
		4/16/2009	Wet	221
2-APP001.53	Appomattox R. at Rt. 10, Hopewell	5/19/2009	Dry	162
		4/16/2009	Wet	245
Chickahominy River				
2-CHK006.14	Chickahominy River, 700 meters above Shields Pt.	4/28/2010	Dry	352
		5/19/2010	Wet	188

Richmond Area Tributaries (James River)				
2-KAN000.03	Kanawha Canal outfall to James R. just above Great Ship Lock	4/15/2009	Dry	17,993
		5/26/2009	Wet	301
2-GIL000.42	Gillie Creek at Williamsburg Rd	5/26/2009	Dry	2,936
		5/7/2009	Wet	2,552 †
Richmond CSO-028	Gillie Creek Open CSO	5/26/2009	Dry	982
		5/7/2009	Wet	887
2-ALM000.42	Almond Creek at Rt. 5	6/18/2009	Dry	3,719
		5/26/2009	Wet	5,290
2-GOD000.77	Goode Creek at Commerce Rd.	4/15/2009	Dry	965
		5/26/2009	Wet	777
2-FAC000.85	Falling Creek at Rt. 1	5/20/2009	Dry	32
		5/7/2009	Wet	203
2-MAN000.19	Manchester Canal below CSO #014	6/30/2009	Dry	5,061
2-CEL001.56	Cornelius Creek at Mill Rd	6/30/2009	Dry	21
2-PCT002.46	Proctors Creek at Rt. 1	6/30/2009	Wet (?)	130
2-XYS000.15	DuPont Spruance East Ditch	5/7/2009	Wet	1,012
2-XSZ002.04	No Name Crk from DGS Center	5/7/2009	Wet	704
2-GRK000.35	Grindall Creek at Station Rd	6/30/2009	Dry	970
2-RDW000.50	Redwater Crk below transformer cracking facility	5/7/2009	Wet	462
2-KSL002.62	Kingsland Crk at Rt. 1 below DGSC stormwater	6/18/2009	Wet	976*

Hopewell Area Tributaries				
2-BLY000.65	Bailey Creek at Rt. 10	5/20/2009	Dry	1,335
		4/16/2009	Wet	4,091
2-BLY003.42	Bailey Creek at Rt. 156	5/20/2009	Dry	333
		4/16/2009	Wet	167
2-BLY005.73	Bailey Creek below Ft. Lee at Rt. 630	6/18/2009	Dry	300
2-CXAN000.08	UT to Bailey Crk. (Bear Crk.)	6/4/2009	Wet	8,770
2-GRV000.01	Gravelly Run 15 M above mouth	5/27/2009	Dry	490
		4/21/2009	Wet	1,684
2-XYO000.03	UT to Cattail Creek at private rd. culvert	5/20/2009	Dry	3,952
		4/21/2009	Wet	3,214
2-PTH000.42	Poythress Run at Station Street	5/20/2009	Dry	233,484
		4/21/2009	Wet	168,606
Misc. PCB Sample Results				
Nelson Ditch	Drainage ditch from Nelson Electric	6/18/2009	Wet	434,768
SIMSCR	South channel draining Sims Metals	6/18/2009	Dry	6,988*
Unnamed Pond	Unnamed Pond between Commerce Rd and the James River; below Peck Metals Fluff Pile	6/18/2009	Dry	37,760*